Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

**Chemical Reactions Study Guide**

Test Sections

1. **Matching**: Match the following vocabulary terms to their definitions.
2. **Multiple choice**: Choose the best answer to each multiple choice question.
3. **Balancing equations**: For each of the following equations, balance the equation, identify the type of reaction (S, D, SR, DR, C), and identify the reactants and products.
4. **Error analysis**: The student who predicted the products of the following reactions made a mistake. Identify the error in each equation, and then write the correct equation.
5. **Short answer**: Answer the following two questions in complete sentences.
   * #1 = law of conservation of matter
   * #2 = reaction rate

Vocabulary

* Activation energy
* Balanced equation
* Catalyst
* Chemical reaction
* Coefficient
* Collision theory
* Combustion reaction
* Decomposition reaction
* Diatomic element
* Double replacement reaction
* Endothermic reaction
* Exothermic reaction
* Law of conservation of matter (mass)
* Precipitate
* Product
* Reactant
* Reaction rate
* Single replacement reaction
* Subscript
* Synthesis reaction

Skills to Know

* Balance chemical equations.
* Identify reactants and products in a chemical reaction.
* Identify reactions as synthesis, decomposition, single replacement, double replacement, or combustion.
* Predict the products of synthesis and decomposition reactions.

Content

**Signs of a Chemical Reaction**

* NEW SUBSTANCE PRODUCED! (most important)
* Unpredictable color change
* Unpredictable temperature change
* Odor
* Gas produced (bubbles)
* Irreversible
* Precipitate formed

**Law of Conservation of Matter**

* Matter cannot be created or destroyed; it can only change form
* The mass of the reactants must equal the mass of the products
* We need to balance chemical equations so that we do not violate the law of conservation of matter
  + Need to make sure that there are the same number of each element on both sides of the equation
* Balanced Chemical Equation:

MgCl2 + 2 CsNO3 🡪 Mg(NO3)2 + 2 CsCl

*reactants products*

**Types of Reactions**

* Synthesis: two or more reactants combine to form a single product
  + A + B 🡪 AB
* Decomposition: one reactant breaks down into multiple products
  + AB 🡪 A + B
* Single replacement: one element replaces another in a chemical reaction
  + Two positives: AB + C 🡪 CB + A
  + Two negatives: AB + C 🡪 AC + B
* Double replacement: two elements switch places in a reaction to produce two new products
  + AB + CD 🡪 AD + CB
* Combustion: a hydrocarbon and oxygen react to produce CO2 and H2O (fire!!)
  + CxHy + O2 🡪 CO2 + H2O

**Predicting the Products of Chemical Reactions**

* Synthesis
  + Label each element’s charge
  + Criss-cross
* Decomposition
  + Separate elements (do NOT write subscripts!)
  + Add a 2 to diatomic elements

**Exothermic and Endothermic Reactions**

* Exothermic reactions: RELEASE energy
  + Clues
    - Make surroundings warmer
    - Burning
    - Exploding
    - Freezing
    - Condensing (gas 🡪 liquid)
    - Sound or light
  + Example: H2 + I2 🡪 2 HI + energy
* Endothermic reactions: REQUIRE/absorb energy
  + Clues
    - Make surroundings colder
    - Growing
    - Melting
    - Boiling/evaporating
    - Cooking
  + Example: 2 POCl3 + heat 🡪 2 PCl3 + O2

**Reaction Rate**

* Collision theory: reactants can form products if they collide with enough energy
* Faster reaction rate = more collisions and/or higher-energy collisions
* Activation energy: minimum amount of energy needed for particles to react
  + Different for each reaction
  + If particles collide with less energy than the activation energy, they will not react
* Five factors that increase reaction rate
  + Increased reactant concentration
    - Higher concentration 🡪 more particles in same amount of space 🡪 particles more likely to collide and therefore more likely to react



* + Increased temperature
    - Higher temperature 🡪 particles have more energy 🡪 move faster and are more likely to collide with other particles 🡪 number of successful collisions increases



* + Increased pressure
    - Increased pressure = smaller space 🡪 particles closer together 🡪 increase frequency of collisions 🡪 particles more likely to react



* + Increased surface area
    - Increased surface area = increased area for reactant particles to collide with 🡪 more collisions and greater chance of reaction



* + Use of a catalyst
    - Catalyst: substance that increases the rate of a reaction without being used up in the reaction
      * Lowers a reaction’s activation energy 🡪 reaction needs less energy to occur

